

CLAIMS

What is claimed:

1. A post crosslinked superabsorbent polymer comprising at least one partially neutralized, uncrosslinked, carboxyl-containing polysaccharide that is
5 preswelled and subsequently dried, wherein the dried polycarboxypolysaccharide is surface-post crosslinked by means of a surface crosslinker.
2. The superabsorbent polymer of Claim 1 wherein the polycarboxypolysaccharide is derived from starch or cellulose or polygalactomannan or from any
10 combination of at least two thereof.
3. The superabsorbent polymer of Claim 1 wherein polycarboxypolysaccharide includes carboxyl groups wherein at least 80% of the carboxyl groups are neutralized.
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4. The superabsorbent polymer of Claim 1 wherein the carboxyl groups are attached to the polycarboxypolysaccharide at least partially in the form of carboxyalkyl groups.
- 20 5. The superabsorbent polymer of Claim 1 wherein the polycarboxypolysaccharide has an average degree of carboxyl group substitution of about 0.3 to about 1.5.

6. The superabsorbent polymer of Claim 1 wherein the uncrosslinked polycarboxypolysaccharide is characterized by a solution viscosity for a 1% solution of about 2,000 mPas or more.

5 7. The superabsorbent polymer of Claim 1 further comprising carboxyl-free polysaccharides.

8. The superabsorbent polymer of Claim 1 wherein the surface crosslinker is present in an amount of about 0.01 to about 25% by weight, based on the
10 polycarboxypolysaccharide.

9. The superabsorbent polymer of Claim 1 wherein the surface crosslinker is formed by salts of aluminum cations which are used in an amount of about 0.2 to about 1.0% by weight, based on the polycarboxypolysaccharide.

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10. The superabsorbent polymer of Claim 1 wherein the surface crosslinker is formed by citric acid used in an amount of about 0.2 to about 8% by weight, based on the polycarboxypolysaccharide.

20 11. The superabsorbent polymer of Claim 1 wherein the surface crosslinker is used in the presence of one or more water-soluble hydrophilic polymers.

12. The superabsorbent polymer of Claim 11 wherein the hydrophilic polymers may be polyalkyleneglycols or polyvinyl alcohols.

13. The superabsorbent polymer of Claim 1 having a retention of about 15 g/g or more and an absorbency against pressure (AAP_{0.7}) value of 11 g/g or more.

5 14. The superabsorbent polymer of Claim 1 having a retention of about 20 g/g or more and an absorbency against pressure (AAP_{0.7}) value of 11 g/g or more.

15. The superabsorbent polymer of Claim 1 having absorbency against pressure (AAP_{0.7}) value for the polymer powder is not less than about 80% of the initial
10 value after ageing for 200 days under standard conditions.

16. The superabsorbent polymer of Claim 1 having about 5% or less by weight of fines having a particle size of below about 150µm after mechanical exposure due to roller milling for 6 minutes.

15 17. The superabsorbent polymer powder according to Claim 1 having a surface crosslinking index (SCI) of about 40 or greater.

18. A post crosslinked superabsorbent polymer comprising at least one
20 partially neutralized, uncrosslinked, carboxyl-containing polysaccharide that is preswelled and dried and surface-post crosslinking the dried polycarboxypolysaccharide by means of a surface crosslinker, wherein the polycarboxypolysaccharide includes one or more water-soluble additives from the group consisting of bases, salts and blowing agents or one or more anti-blocking additives from the group consisting of natural fiber

materials, synthetic fiber materials, silica gels, synthetic silicas and water-insoluble mineral salts or any combination of at least two there from.

19. The superabsorbent polymer of Claim 18 wherein the surface crosslinker
5 is formed by salts of aluminum cations which are used in an amount of about 0.2 to about 1.0% by weight, based on the polycarboxypolysaccharide.

20. The superabsorbent polymer of Claim 18 wherein the blowing agents
release a gas under the influence of a catalyst or heat.

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21. The superabsorbent polymer of Claim 18 wherein the water-soluble
additives and antiblocking additives are each included in amounts of about 0.01 to about 20% by weight, based on polycarboxypolysaccharide.

15 22. The superabsorbent polymer of Claim 18 wherein the surface crosslinker is formed by citric acid used in an amount of about 0.2 to about 8% by weight, based on the polycarboxypolysaccharide.

23. A post crosslinked superabsorbent polymer comprising at least one
20 partially neutralized, uncrosslinked, carboxyl-containing polysaccharide post crosslinking wherein the polycarboxypolysaccharide is surface crosslinked by means of a surface crosslinker, wherein the surface crosslinker may be ionic or covalent crosslinkers or any combination of these post crosslinking.

24. The superabsorbent polymer of Claim 23 wherein the ionic surface crosslinkers are salts of at least divalent cations and the covalent surface crosslinkers are acid-functional substances.

5 25. The superabsorbent polymer of Claim 23 wherein the surface crosslinker is formed by salts of aluminum cations which are used in an amount of about 0.2 to about 1.0% by weight, based on the polycarboxypolysaccharide.

26. The superabsorbent polymer of Claim 23 wherein the surface crosslinker
10 is formed by citric acid of about 0.2 to about 8% by weight, based on the polycarboxypolysaccharide.

27. The superabsorbent polymer of Claim 23 wherein the covalent surface post crosslinker is used in the presence of one or more crosslinking catalysts.

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28. The superabsorbent polymer of Claim 23 wherein the ionic surface crosslinkers are salts of at least divalent cations and the covalent surface crosslinkers are acid-functional substances and wherein the covalent surface post crosslinker is used in the presence of one or more crosslinking catalysts.

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29. The superabsorbent polymer of Claim 23 wherein the covalent surface post crosslinker is used in the presence of one or more crosslinking catalysts selected from the group consisting of mineral acids, Lewis acids, acetylacetonates and hypophosphites.

30. The superabsorbent polymer of Claim 23 wherein the ionic surface crosslinkers are salts of at least divalent cations and the covalent surface crosslinkers are acid-functional substances and wherein the covalent surface post crosslinker is used in the presence of one or more crosslinking catalysts selected from the group consisting of
5 mineral acids, Lewis acids, acetylacetonates and hypophosphites.

31. An absorbent post crosslinked polymer comprising at least one partially neutralized, uncrosslinked, carboxyl-containing polysaccharide and a post crosslinking surface crosslinker, wherein the surface post crosslinking utilizes ionic or covalent
10 crosslinkers or a combination thereof, wherein the ionic surface crosslinkers are salts of at least divalent cations and the covalent surface crosslinkers are acid-functional substances, wherein the polyvalent cation is formed from the group consisting of Mg^{2+} , Ca^{2+} , Al^{3+} , Ti^{4+} , Fe^{2+}/Fe^{3+} , Zn^{2+} and Zr^{4+} , and the acid-functional substances are formed from low molecular weight and polymeric polycarboxylic acids.

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32. The superabsorbent polymer of Claim 31 wherein the surface crosslinker is present in an amount of about 0.01 to about 25% by weight, based on the polycarboxypolysaccharide.

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33. The superabsorbent polymer of Claim 31 wherein the surface crosslinker is formed by salts of aluminum cations which are used in an amount of about 0.2 to about 1.0% by weight, based on the polycarboxypolysaccharide.

34. The superabsorbent polymer of Claim 31 wherein the surface crosslinker is formed by citric acid in the amount of about 0.2 to about 8% by weight, based on the polycarboxypolysaccharide.

5 35. The superabsorbent polymer of Claim 31 wherein the covalent surface post crosslinker is used in the presence of one or more crosslinking catalysts.

36. The superabsorbent polymer of Claim 31 wherein the covalent surface post crosslinker is used in the presence of one or more crosslinking catalysts selected
10 from the group consisting of mineral acids, Lewis acids, acetylacetonates and hypophosphites.

37. The superabsorbent polymer of Claim 35 wherein the ratio by weight of the surface post crosslinker to the crosslinking catalysts is from about 1:0.001 to about
15 1:1.

38. A process for preparing superabsorbent polymers comprising the steps of
a) forming a hydrogel by mixing an uncrosslinked polycarboxypolysaccharide with water; b) the hydrogel is mechanically comminuted and dried; c) the dried hydrogel is
20 comminuted and classified to form a polymer particles; and d) the polymer particles are coated with a solution of a crosslinker and subjected to a surface post crosslinking.

39. The process of Claim 38 wherein the mixing of polycarboxypolysaccharide and water is carried out in a continuous mixer.

40. The process of Claim 38 wherein the mixing of polycarboxypolysaccharide and water is carried out in a batch mixer.

41. The process of Claim 38 wherein the mixture of polycarboxypolysaccharide and water has a pH of about 6 or more.

42. The process of Claim 38 wherein the mixture of polycarboxypolysaccharide and water has a pH of about 10 or more.

43. The process of Claim 38 wherein the mixture of polycarboxypolysaccharide and water includes from about 5 to about 65% by weight of polycarboxypolysaccharide.

44. The process of Claim 38 wherein the mixture of polycarboxypolysaccharide and water includes about 0.01 to about 20% by weight, based on the solids content, of one or more water-soluble additives from the group consisting of bases, salts and blowing agents.

45. The process of Claim 38 wherein the carboxyl groups of the polycarboxypolysaccharide are 80% neutralized or more.

46. The process of Claim 38 wherein up to about 30% by weight of the water in the mixture of polycarboxypolysaccharide and water is replaced by one or more water-miscible organic solvents which do not dissolve the polycarboxypolysaccharide.

47. The process of Claim 38 wherein the mixture of polycarboxypolysaccharide and water includes about 0.01 to about 20% by weight, based on the solids content, of one or more antiblocking additives.

5 48. The process of Claim 38 wherein the drying of the hydrogel is effected at temperatures above about 70°C.

49. The process of Claim 38 wherein the hydrogel is dried to a moisture content of about 30% by weight or less.

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50. The process of Claim 38 wherein about 0.01 to about 25% by weight of covalent or ionic surface post crosslinkers or a combination of at least two thereof, based on the polymer powder, is added in the form of about 0.01 to about 80% by weight aqueous solution.

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51. The process of Claim 50 wherein the aqueous solution of the covalent surface post crosslinker further includes a crosslinking catalyst.

52. The process of Claim 51 wherein the weight ration of surface crosslinker to crosslinking catalyst is about 1:0.001 to about 1:1.

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53. The process of Claim 38 characterized in that the surface post crosslinking is carried out at temperatures of about 40°C to about 250°C.

54. An absorbent post crosslinked polymer of Claim 38.

55. Absorbent hygiene product comprising an superabsorbent polymer comprising at least one partially neutralized, uncrosslinked, carboxyl-containing polysaccharide that is preswelled and subsequently dried, wherein the dried polycarboxypolysaccharide is surface-post crosslinked by means of a surface crosslinker.

56. The absorbent hygiene product of Claim 55 wherein the polycarboxypolysaccharide is derived from starch or cellulose or polygalactomannan or from any combination of at least two thereof.

57. The absorbent hygiene product of Claim 55 wherein polycarboxypolysaccharide includes carboxyl groups wherein at least 80% of the carboxyl groups are neutralized.

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58. The absorbent hygiene product of Claim 55 wherein the carboxyl groups are attached to the polycarboxypolysaccharide at least partially in the form of carboxyalkyl groups.

59. The absorbent hygiene product of Claim 55 wherein the polycarboxypolysaccharide has an average degree of carboxyl group substitution of about 0.3 to about 1.5.

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60. The absorbent hygiene product of Claim 55 wherein the uncrosslinked polycarboxypolysaccharide is characterized by a solution viscosity for a 1% solution of about 2,000 mPas or more.

5 61. The absorbent hygiene product of Claim 55 further comprising carboxyl-free polysaccharides.

62. The absorbent hygiene product of Claim 55 wherein the surface crosslinker is present in an amount of about 0.01 to about 25% by weight, based on the
10 polycarboxypolysaccharide.

63. The absorbent hygiene product of Claim 55 wherein the surface crosslinker is formed by salts of aluminum cations which are used in an amount of about 0.2 to about 1.0% by weight, based on the polycarboxypolysaccharide.

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64. The absorbent hygiene product of Claim 55 wherein the surface crosslinker is formed by citric acid used in an amount of about 0.2 to about 8% by weight, based on the polycarboxypolysaccharide.

20 65. The absorbent hygiene product of Claim 55 wherein the surface crosslinker is used in the presence of one or more water-soluble hydrophilic polymers.

66. The absorbent hygiene product of Claim 55 wherein the superabsorbent polymer has a retention of about 15 g/g or more and an absorbency against pressure (AAP_{0.7}) value of 11 g/g or more.

5 67. The absorbent hygiene product of Claim 55 wherein the superabsorbent polymer has absorbency against pressure (AAP_{0.7}) value for the polymer powder is not less than about 80% of the initial value after ageing for 200 days under standard conditions.

10 68. The absorbent hygiene product of Claim 55 wherein the superabsorbent polymer has about 5% or less by weight of fines having a particle size of below about 150µm after mechanical exposure due to roller milling for 6 minutes.

69. The absorbent hygiene product of Claim 55 wherein the superabsorbent
15 polymer powder has a surface crosslinking index (SCI) of about 40 or greater.

70. Absorbent hygiene product comprising an superabsorbent polymer comprising at least one partially neutralized, uncrosslinked, carboxyl-containing polysaccharide that is preswelled and dried and surface-post crosslinking the dried
20 polycarboxypolysaccharide by means of a surface crosslinker, wherein the polycarboxypolysaccharide includes one or more water-soluble additives from the group consisting of bases, salts and blowing agents or one or more anti-blocking additives from the group consisting of natural fiber materials, synthetic fiber materials, silica gels, synthetic silicas and water-insoluble mineral salts or any combination of at least two there from.